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| 09/965,683 | 09/27/2001 | Edward J. A. Pope | POPE#5(CIP) | 3284 |
| 7590 02/07/2005 W. Edward Johansen 11661 San Vicente Boulevard Los Angeles, CA 90049 | | | EXAMINER LUM, LEON YUN BON | |
| | | | ART UNIT 1641 | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|---|--|
| Office Action Summary | Application No. 09/965,683 | Applicant(s) POPE, EDWARD J. A. | |
| | Examiner Leon Y Lum | Art Unit 1641 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 April 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:
 - a. In line 2 of page 1, the term "08/112,398" seems like it should be "09/112,398".
 - b. Since there are drawings, the specification must include a section titled "Brief Description of Drawings" which includes a description for each figure of the drawings.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 12 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The instant claim is directed towards detectors

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connected by conductive electrodes. However, the specification does not disclose conductive electrodes that connect the detectors, and one of ordinary skill in the art at the time of the invention would not know how the detectors are each connected by conductive electrodes as claimed. Are the detectors connected to each other by the conductive electrodes or are the detectors connected to another embodiment by the conductive electrodes?

4. Claim 12 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification and drawings disclose optical detectors, as indicated by depictions of silicon based photodetectors in the Figures. See Figures 6-11. Although the specification describes conductive electrodes as background information (see page 19, line 16 to page 20, line 8) , there is no disclosure of conductive electrodes in the claimed invention and the Figures show that the detectors are connected only to a substrate, which is not disclosed in the specification as having conductive electrodes. In addition, the status of the art at the time of the invention teaches that the conductive electrodes are detectors that act independently of optical detectors and does not indicate how conductive electrodes can be combined with optical detectors. Lev et al reference (US 5,403,462) teaches conductive electrodes that sense a heterogenous charge transfer process to detect target analyte in an electrochemical biosensor. See

column 4, lines 35-45. Lev et al reference does not mention combining optical detection in with the electrochemical detection. Since the specification and drawings do not provide any direction or guidance on how the conductive electrodes are attached to the detectors and the status of the art at the time of the invention does not indicate that conductive electrodes can be used with optical detectors, one of ordinary skill in the art at the time of the invention would not know how each detector is connected by conductive electrodes.

In addition, the specification does not provide working examples to indicate how conductive electrodes are connected to the light source or to the detectors and since it has been established that the status of the art at the time of the invention does not teach how conductive electrodes can be applied with optical detectors, one of ordinary skill in the art at the time of the invention would not know how to make or use the invention as claimed.

Since the instant claim is not enabled, a prior art search cannot be performed for the instant claim.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 3-9 and 12-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. In claims 3-6, the phrase "the light source" (line 1) is vague and indefinite. The parent claim (claim 2) recites the limitation "one or more light sources" (line 2). In the event that the invention has more than one light source, it is unclear which light source the instant phrase refers to.

8. In claim 6, lines 1-2, the phrase "the light source is connected by conductive electrodes" is vague and indefinite. The specification does not provide disclosure on how conductive electrodes are connected to the light source and it is unclear as to whether the conductive electrodes connect the light source to another embodiment and what that embodiment is, or whether the conductive electrodes connect light sources to each other in the situation wherein there is more than one light source.

9. In claims 7-9, the phrase "the detector" (line 1) is vague and indefinite. The parent claim (claim 2) recites the limitation "one or more optical detectors" (lines 2-3). In the event that the invention has more than one optical detector, it is unclear which detector the instant phrase refers to.

10. In claim 12, line 3, the phrase "each detector is connected by conductive electrodes" is vague and indefinite. The specification does not provide disclosure on how conductive electrodes are connected to each detector and it is unclear as to whether the conductive electrodes connect each detector to another embodiment and

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what that embodiment is, or whether the conductive electrodes connect the detectors to each other.

11. In claims 13-32, the term "coupled" (line 1) is vague and indefinite. In the instant claims, it is unclear if the embodiments following the instant term is part of the chip or if the embodiments are detected by the sensor. For example, in claim 13, it is unclear if the "bioactive material" (line 2) is part of the chip or if the sensor detects the "bioactive material".

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1, 9-11, and 17 are rejected under 35 U.S.C. 103(b) as being clearly anticipated by Walt et al (US 5,244,636).

Walt et al reference teaches a plurality of fiber optical strands forming a unitary imaging fiber optic array (i.e. chip comprising a plurality of sensors) having two discrete ends for precise spatial positional introduction and conveyance of light energy via different fiber optical strands within said imaging fiber optic array (i.e. each sensor contains a light source), and wherein the sensor employs a CCD array (each sensor

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contains an optical detector). See column 4, lines 53-68; column 9, lines 36-47; column 13, lines 43-57; and Figures 6-8.

With regards to claims 9-11, Walt et al reference teaches a fiber optic sensor array, as stated above, which can measure infrared light, visible light, and ultraviolet light wavelengths (i.e. multiple detectors tuned to a different wavelength range of light), wherein the diversity and range of the sensor is limited only by the wavelengths of light energy required and choice of light energy absorbing dyes. Walt et al reference also teaches that the fiber optic sensor array provides making different optical determinations with spatial resolution of individual light energy intensities and no overlap in spectral properties (i.e. produces a spectra). See column 4, lines 53-68 and column 9, lines 3-35.

With regards to claim 17, Walt et al reference teaches a dyes disposed on one optic array surface of the imaging fiber optic sensor (i.e. sensor coupled to dye), wherein the dye is fluorescein (i.e. organic). See column 16, line 67 to column 17, line 4; and Table 1.

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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15. Claim 1 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Kroy et al (US 5,252,294).

Kroy et al reference teaches a structure 1 (i.e. chip) with several cavities or depressions 2 with a CCD array (i.e. plurality of sensors). See column 2, lines 35-38; column 6, lines 40-63, especially lines 58-63; and Figures 1 and 10.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. Claims 2, 7, and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214).

Kroy et al reference has been disclosed above and additionally teaches a CCD array in the same arrangement as the microcavities, indicated by the CCD cells 17' (i.e. each of plurality of sensors contains one optical detector), and a pen 16 suitable for applying light irradiation through windows 17 into chambers 2 (i.e. light source). See column 6, lines 40-65, especially lines 58-63; and Figures 1 and 10.

However, Kroy et al reference fails to teach that each sensor comprises one or more light sources.

Hamblen reference teaches an array of LEDs 25 spaced apart by opaque separators 17, in order to prevent cross talk with adjacent light guides. See column 2, lines 29-55; column 4, lines 4-10 and Figure 1.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al with an array of LEDs 25 spaced apart by opaque separators 17, as taught by Hamblen, in order to prevent cross talk with adjacent light guides. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including an array of LEDs, as taught by Hamblen, in the device of Kroy et al, since Kroy et al teach light irradiation through windows into individual chambers, and the LEDs of Hamblen are designed to provide a source of light into individual chambers separated by the opaque separators.

With regards to claim 7, Kroy et al reference teaches that the sensors can be silicon (i.e. semiconducting material). See column 5, lines 33-34.

With regards to claims 13-16, Kroy et al reference teaches substances including immobilized antibody and antigen (i.e. bioactive material, protein, antibody), wherein

substances are examined for immune reactions and the substances can be provided with fluorescent markings (i.e. fluorescence-labeled antibody). See column 1, lines 9-24 and column 4, lines 5-9 and 31-32.

19. Claims 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and further in view of Berndt et al (US 5,281,825).

Kroy et al and Hamblen references have been disclosed above, but fail to teach that the light source is an electroluminescent material (claim 3).

Berndt et al reference teaches phosphor particles in an ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. See column 3, lines 6-26; column 6, lines 53-56; column 10, lines 62-65; and Figure 4.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with phosphor particles in an ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, as taught by Berndt et al, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including phosphor containing ELL as a light source, as taught by Berndt et al, in the device of Kroy et al and Hamblen, since Kroy et al and Hamblen teach an array of light

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sources directed into a chip with individual chambers, and the ELLs taught by Berndt et al can be directed simultaneously at wells in a 96-well plate, which is one type of chip with individual chambers.

With respect to claim 6, Berndt et al reference teaches a first electrode 20 and a second electrode 21 that sandwiches the phosphor particles (i.e. light source is connected by conductive electrodes). See column 10, lines 62-67 and Figure 4.

20. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and in further view of Berndt et al (US 5,281,825) and Hosokawa et al (US 5,121,029).

Kroy et al and Hamblen references have been disclosed above, but fail to teach that the light source is an organic electroluminescent material.

Berndt et al reference teaches ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, and wherein the ELL contains phosphor particles, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. See column 3, lines 6-26; column 6, lines 53-56; column 10, lines 62-65; and Figure 4. However, Berndt et al reference fails to teach that the ELL is an organic electroluminescent material.

Hosokawa et al reference teaches an electroluminescence device that emits light with an organic element, in order to permit greatly reduced voltages to be applied. See column 1, lines 10-35.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, and wherein the ELL contains phosphor particles, as taught by Berndt et al, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including phosphor containing ELL as a light source, as taught by Berndt et al, in the device of Kroy et al and Hamblen, since Kroy et al and Hamblen teach an array of light sources directed into a chip with individual chambers, and the ELLs taught by Berndt et al can be directed simultaneously at wells in a 96-well plate, which is one type of chip with individual chambers.

It would also have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al, Hamblen, and Berndt et al with an electroluminescence device that emits light with an organic element, as taught by Hosokawa et al, in order to permit greatly reduced voltages to be applied. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including an organic element, as taught by Hosokawa et al, in the device of Kroy et al, Hamblen, and Berndt et al, since Kroy et al, Hamblen, and Berndt et al teach electroluminescent elements that emit light, and the organic element taught by Hosokawa et al is one type of electroluminescent element.

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21. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and in further view of Berndt et al (US 5,281,825) and Waymouth (US 5,095,245).

Kroy et al and Hamblen references have been disclosed above, but fail to teach that the light source is an inorganic electroluminescent material.

Berndt et al reference teaches ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, and wherein the ELL contains phosphor particles, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. See column 3, lines 6-26; column 6, lines 53-56; column 10, lines 62-65; and Figure 4. However, Berndt et al reference fails to teach that the ELL is an inorganic electroluminescent material.

Waymouth reference teaches an electroluminescent device that is preferably composed of inorganic materials, including phosphor materials such as zinc sulfide, in order to provide an EL device having higher efficiency and improved light output. See column 2, lines 40-42 and column 4, lines 4-35.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with ELL as a light source, wherein ELLs can be used to illuminate samples contained in a 96-well assay simultaneously, and wherein the ELL contains phosphor particles, as taught by Berndt et al, in order to measure the concentration of an analyte by utilizing luminescence lifetimes. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including phosphor containing ELL as a light

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source, as taught by Berndt et al, in the device of Kroy et al and Hamblen, since Kroy et al and Hamblen teach an array of light sources directed into a chip with individual chambers, and the ELLs taught by Berndt et al can be directed simultaneously at wells in a 96-well plate, which is one type of chip with individual chambers.

It would also have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al, Hamblen, and Berndt et al with an electroluminescent device that is preferably composed of inorganic materials, including phosphor materials such as zinc sulfide, as taught by Waymouth, in order to provide an EL device having higher efficiency and improved light output. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including an inorganic element, as taught by Waymouth, in the device of Kroy et al, Hamblen, and Berndt et al, since Kroy et al, Hamblen, and Berndt et al teach electroluminescent elements that emit light, and the organic element taught by Hosokawa et al is one type of electroluminescent element.

22. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and further in view of Aktik (US 4,866,499).

Kroy et al and Hamblen references have been disclosed above, but fail to teach that the detector is composed of amorphous silicon (claim 8).

Aktik reference teaches a hydrogenated amorphous-silicon photosensitive diode element, wherein the photosensitive elements can be placed in an array, in order to

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overcome disadvantages of CCD devices including a large number of processing steps for fabrication and poor sensitivity for short wavelengths of light. See column 1, lines 26-49 and column 2, lines 3-9.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with a hydrogenated amorphous-silicon photosensitive diode element, as taught by Aktik, in order to overcome disadvantages of CCD devices including a large number of processing steps for fabrication and poor sensitivity for short wavelengths of light. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including an amorphous silicon photosensitive diode, as taught by Aktik, in the device of Kroy et al and Hamblen, since Kroy et al and Hamblen teach optical detector arrays, and the photosensitive elements of Aktik also detect optical signals and can be placed in an array format.

With respect to claims 9-11, Aktik reference teaches that the photosensitive diode element is sensitive to blue and ultraviolet wavelengths (i.e. tuned to respond to a specific wavelength range of light; tuned to a different wavelength range of light). See column 5, lines 9-11. Aktik reference does not explicitly teach that each detector is tuned to a different wavelength range of light. However, since the photosensitive diode elements are disclosed as having the capability of detecting a plurality of wavelengths, and Kroy et al and Hamblen reference teaches separate detectors for individual chambers, the instant references encompass the situation wherein one photosensitive element detects blue wavelength and another photosensitive element detects ultraviolet

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wavelengths, and reads on the limitations of claims 10-11 in being able to be "tuned to a different wavelength range of light". In claim 11, the phrase "and the output of these detectors produces a spectra" is considered an intended use of the chip and does not provide patentable weight to the claimed invention.

23. Claims 17-19, 23-24, and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and further in view of Pope (SPIE, 1992, vol. 1758, pp. 360-371).

Kroy et al and Hamblen references have been disclosed above, and Kroy et al reference additionally teaches that substances in the cavities can be gels. See column 4, lines 35-36. However, Kroy et al and Hamblen fail to teach that each sensor is coupled to a porous silica gel microsphere doped with an organic dye.

Pope reference teaches fluorescent organic rhodamine dyes incorporated into microspheres, wherein the microspheres are silica gel-based, in order to produce chemical sensors based on optically active molecules incorporated into the microspheres. See page 361, 1st-2nd paragraph and page 363, 2nd paragraph.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with fluorescent organic dyes incorporated into silica microspheres, as taught by Pope, in order to produce chemical sensors based on optically active molecules incorporated into the microspheres. One of ordinary skill in the art at the time of the invention would have reasonable expectation of

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success in including fluorescent organic dyes incorporated into silica microspheres, as taught by Pope, in the device of Kroy et al and Hamblen since Kroy et al teach a structure that can hold gels in the cavities and detect fluorescence, and the rhodamine-doped silica gel-based microspheres of Pope are one type of gel with fluorescence properties.

24. Claims 20-22, 25-27, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroy et al (US 5,252,294) in view of Hamblen (US 4,948,214) as applied to claim 2 above, and further in view of Torobin (US 4,743,545) and Torobin (US 4,671,909).

Kroy et al and Hamblen references have been disclosed above. Kroy et al reference additionally teaches that substances in the cavities can be gels and that the structure can be used for cell and immunity research and medical research. See column 1, lines 37-44 and column 4, lines 35-36. However, Kroy et al and Hamblen references fail to teach that each sensor is coupled to a porous silica gel microsphere doped with a protein or enzyme, and fail to teach that each sensor is coupled to a porous silica gel microsphere doped with a living cell.

Torobin ('545) reference teaches hollow porous microspheres encapsulating biocatalysts including cells, enzymes, and antibodies, in order to provide biocatalysts to quantify biological substances or perform biotech processes including protein binding assays and catalyzing enzyme and bacterial biochemical reactions, wherein a gel-forming material immobilizes the biocatalyst within the microspheres. See column 1,

lines 26-35 and column 28, line 63 to column 29, line 20. However, Torobin ('545) reference fails to teach that the gel-forming material is silica gel.

Torobin ('909) reference teaches silica sol gel in microspheres, in order to reduce the void content and increase the surface area of support in the pores in which it is desired to place a semipermeable membrane that seal the microsphere pores, but can selectively allow passage of nutrients and oxygen into the hollow microspheres and allow passage of biologically produced products and/or waste products out of the hollow microspheres. See column 3, lines 2-6; column 11, line 52 to column 12, line 19; and Figures 6A-B.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al and Hamblen with hollow porous microspheres encapsulating biocatalysts including cells, enzymes, and antibodies, as taught by Torobin ('545) in order to provide biocatalysts to quantify biological substances or perform biotech processes including protein binding assays and catalyzing enzyme and bacterial biochemical reactions. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including microspheres encapsulated with cells, enzymes, and antibodies, as taught by Torobin ('545) in the device of Kroy et al and Hamblen since Kroy et al and Hamblen teach a structure with cavities that can hold a gel for cell, immunity, and medical research, and the microspheres of Torobin ('535) include a gel-forming substance and provide antibodies for protein binding assays, which are components in immunity and medical research.

In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Kroy et al, Hamblen, and Torobin ('545) with silica sol gel in microspheres, as taught by Torobin ('909), in order to reduce the void content and increase the surface area of support in the pores in which it is desired to place a semipermeable membrane that seal the microsphere pores, but can selectively allow passage of nutrients and oxygen into the hollow microspheres and allow passage of biologically produced products and/or waste products out of the hollow microspheres. One of ordinary skill in the art at the time of the invention would have reasonable expectation of success in including silica sol gel in microspheres, as taught by Torobin ('909) in the device of Kroy et al, Hamblen, and Torobin ('545), since Kroy et al, Hamblen, and Torobin ('545) teach a structure with cavities that can hold a gel, and the silica sol gel of Torobin ('909) are one type of gel substance.

Conclusion

25. No claims are allowed.

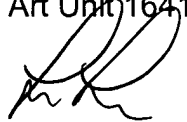
26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon Y Lum whose telephone number is (571) 272-2878. The examiner can normally be reached on 8:00am-5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on (571) 272-0823. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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